6450-01-P

DEPARTMENT OF ENERGY

Notice of Request for Expressions of Interest in an Advanced Burner Reactor to Support the Global Nuclear Energy Partnership

AGENCY: Office of Nuclear Energy, Department of Energy

ACTION: Notice of request for expressions of interest.

SUMMARY: Based upon feedback since the President of the United States announced the Global Nuclear Energy Partnership (GNEP) in February 2006, the U.S. Department of Energy (DOE) is seeking Expressions of Interest (EOI) from domestic and international industry in building an Advanced Burner Reactor (ABR). An ABR in the United States would establish a fast reactor capability to be used to transmute fuel and consume transuranic elements within the fuel, generate electricity, and support implementation of GNEP. DOE is also seeking to define the interest of industry to build upon their proven capabilities and participate in demonstrating spent nuclear fuel (SNF) recycling technologies that meet GNEP goals. This EOI will help inform DOE's GNEP Program as to those issues that industry and potential host sites consider important to the construction of sustainable, commercial-scale SNF recycling technologies that meet GNEP objectives. The information gained from this EOI will be used to create Requests for Proposals (RFP) for the proposed ABR.

DATES: Interested parties wishing to submit an EOI should do so in writing by September 8, 2006, to ensure their input is considered. A briefing for respondents to learn about DOE's baseline plan and answer EOI-related questions will be held on August 14, 2006, 8:00am – 12:00pm, in the Washington, D.C. metropolitan area. The specific meeting location will be

announced on the GNEP website, http://www.gnep.energy.gov. Please indicate your interest in attending the briefing by sending an email indicating your intent to attend to GNEP_EOI_RSVP@nuclear.energy.gov. It is recognized that GNEP is moving forward on an aggressive schedule that will task all of the responders' abilities to provide quality information in a short period of time. DOE believes that GNEP can help to revitalize the U.S. nuclear industry and improve its global competitive position. Early participation by industry in this effort will greatly maximize GNEP's success.

FOR FURTHER INFORMATION CONTACT: By postal mail, Mr. John F. Gross, Mail Stop: NE-2.4/Germantown, 1000 Independence Avenue, S.W., Washington D.C. 20585-0119; by phone on 301-903-3918; by email at GNEP_EOI_RSVP@nuclear.energy.gov.

ADDRESSES: Please send all hardcopy Expressions of Interest to Mr. John F. Gross, Mail Stop: NE-2.4/Germantown, U.S. Department of Energy, 1000 Independence Avenue, S.W., Washington, D.C. 20585-0119. Electronic versions of the Expressions of Interest may be submitted in pdf (portable document format) format by email to GNEP_EOI_RSVP@nuclear.energy.gov.

SUPPLEMENTAL INFORMATION:

Background

As part of President Bush's Advanced Energy Initiative, DOE has launched the Global Nuclear Energy Partnership (GNEP). The broad goals of GNEP are described in the Report to Congress – Spent Nuclear Fuel Recycling Program Plan issued May 2006, http://www.gnep.energy.gov/pdfs/snfRecyclingProgramPlanMay2006.pdf.

A major element of GNEP is the development and deployment of advanced nuclear fuel recycling technologies. In general, advanced recycling technologies focus on three operations:

(1) Separate commercial LWR SNF into its usable and waste components.

Spent nuclear fuel contains uranium, transuranics (plutonium and other long-lived radioactive elements), and fission products. The fission products are waste and make up less than five percent of the used fuel. Buildup of fission products within the fuel inhibits nuclear fission reactions so the spent fuel must be replaced with fresh fuel for continued operation of a nuclear reactor. The transuranics and uranium in SNF would be separated from the fission products and then fabricated into new fuel for a fast reactor to consume the transuranics and uranium while simultaneously recovering their energy content. The SNF recycling program would use advanced separation processes (e.g., Uranium Extraction Plus or other comparable processes).

(2) Fabricate and recycle fast reactor fuel containing transuranic elements.

Fabricating, testing, and qualifying fast reactor fuel containing transuranic and actinide elements (i.e., transmutation fuel), obtained from recycled spent fast reactor fuel, is required to provide fresh fuel for the reactor. After the qualification of transmutation fuel, the GNEP facilities would demonstrate recycle of fast reactor transmutation fuel and eventually could include the construction of a separate transmutation fuel separations and fabrication facility.

(3) Convert transuranics into shorter-lived radioisotopes while producing electricity.

Fast reactors produce high-energy neutrons that can fission long-lived transuranics, thus converting the transuranics into shorter-lived radioisotopes. As the transuranics are consumed, significant energy is released that can be used to produce electricity from material that would otherwise be considered waste and potentially require disposal in a geologic repository.

The Department initially announced an approach that would demonstrate technologies from the laboratory at engineering scale, prior to a second phase of commercialization. This approach is described in the Report to Congress – Spent Nuclear Fuel Recycling Program Plan issued May 2006, http://www.gnep.energy.gov/pdfs/snfRecyclingProgramPlanMay2006.pdf.

Following the announcement of the GNEP Program by the President, a number of foreign governments and private companies expressed interest in cooperating in the near-term with the Department in the development and deployment of advanced recycling technologies. Some of these entities indicated they are pursuing similar technologies and, in some cases, these technologies may be ready for deployment prior to those currently under development by the Department. In light of this information, DOE seeks to determine the feasibility of accelerating the development and deployment of advanced recycling technologies that would enable commercial scale demonstrations that meet GNEP objectives. These demonstrations would utilize industry expertise to build the well-understood stages of advanced technology for the separation of LWR SNF, and the construction and operation of a fast reactor, while designing in the modules for incorporating group separation of actinides, transmutation fuel production,

burning, and recycling operations.

This approach would involve two simultaneous tracks: (1) deployment of commercial scale facilities for which advanced technologies are available now or in the near future and (2) further research and development on transmutation fuels technologies. This two-track approach could result in two commercial scale facilities, one of which is the subject of this EOI. These facilities are:

- Consolidated Fuel Treatment Center (CFTC) – a facility to separate the usable uranium and transuranics from spent light-water reactor fuel for use in fabricating fast reactor fuel. During the second track the CFTC would be augmented or a separate transmutation fuel separations and fabrication facility would be constructed to separate and fabricate fast reactor transmutation fuel.

- Advanced Burner Reactor (ABR; subject of this EOI) – fast reactor to use transmutation fuel and consume transuranic elements within the fuel and generate electricity. The ABR is expected to be qualified with conventional fast reactor fuel. Subsequently, the ABR would be used to demonstrate the feasibility of recycling fast reactor transmutation fuel.

A third facility, the Advanced Fuel Cycle Facility (AFCF), will be designed and directed through DOE's national laboratories and will support development of the technologies required to separate and fabricate fast reactor transmutation fuel. The AFCF is not currently a subject of a Request for Expressions of Interest.

ABR Characteristics

DOE prefers to constrain as little as possible this EOI on the fuel cycle pathway to meet GNEP goals. Industry's input is valuable in considering the ultimate technical and pragmatic configuration of GNEP's closed fuel cycle. Some rough parameters for considering the ultimate characteristics of an ABR for the GNEP Technology Demonstration Program are set out below. They simply illustrate the type of information DOE is requesting in this EOI and respondents should not interpret the following information as a final decision from DOE on the ABR's characteristics or the overall demonstration program. The responses to this EOI may significantly influence subsequent RFPs.

Desired ABR General Characteristics

The ABR is essential to perform key functions in support of GNEP technology development objectives, including:

- Providing a fast neutron reactor necessary to consume the transuranic and actinide elements contained in transmutation fuel, i.e., fuel that is fabricated from uranium, plutonium, and other transuranics found in light water reactor (LWR) spent fuel.

- Generating and providing electricity to a power grid and contribute to commercial sustainability. Thus, the ABR would consume transuranic elements in fuel made possible by other key elements of the technology program: separation of LWR and fast reactor SNF into

their usable components and the fabrication of transmutation fuel from those components.

- Consuming transuranic elements separated from LWR SNF. See the Consolidated Fuel Treatment Center (CFTC) EOI for a discussion of that element.

- Ensuring that facility designs meet U.S. standards for safeguards and security.

Developing this complete system to support GNEP remains the central objective, drawing upon the expertise and capabilities of industry and international partners to achieve it. Further,

- The ABR shall safely and reliably perform its power generation and transmutation functions. The ABR shall be capable of being licensed by the U.S. Nuclear Regulatory Commission (NRC) and operated in accordance with NRC regulations. The ABR shall incorporate design features and technologies to promote reliable system performance during normal operations and in response to postulated accident scenarios.

- The ABR shall be designed such that the future cost of electrical power generation using ABRs can be shown to be economical, with a goal of being competitive with Advanced Light Water Reactors, reasonably accounting for any externalities.

- ABRs shall be capable of generating power through the net destruction of transuranic material.

- The strategy for potential development of ABRs shall be made to be as affordable as possible without introducing undue risk into the development effort so as to place in serious jeopardy the potential to successfully achieve the ABR mission.

- To support timely implementation supportive of GNEP goals, the ABR system shall be capable of commercial deployment as early as possible.

Example Technical Characteristics of the ABR

- Reactor neutron energy spectrum: Fast

- Reactor technology: Pool-type sodium cooled

- Power conversion technology: Steam-Rankine or Super-critical CO_2 Brayton Cycle

- Reactor fuel type: Oxide or metal based

- Reactor unit thermal power: 500 MWt – 2000 MWt

- Electrical power from reactor unit: 200 MWe – 800 MWe, generated electricity can be provided to a commercial power grid

- For modular approach, technology for reactor unit should be scalable to higher power levels

up to at least 1 GWe

- The ABR would have the capability of being started on conventional fast reactor driver fuel, transitioned to full core operation on transmutation fuel, and provide a capability for transmuting minor actinide targets prior to this transition

- Process storage capacity: Sufficient process storage capacity should be included to support full-scale plant operations, including storage of spent fuel prior to recycling.

Geographic

- The reactor may be collocated with the SNF processing and fuel fabrication operations. This is not a requirement but rather a possibility.

Regulatory

- Must comply with all environmental protection laws and regulations.

- Must be capable of being licensed under NRC regulations applicable to demonstration operations on privately owned land regardless of where the demonstration is sited.

Content of EOI

The following items identify the information that DOE is requesting in this EOI. All respondents are encouraged to provide information beyond that requested if it is believed to be beneficial to their responses.

1. Level of interest and proposed scope of interest

Please describe how you believe DOE could accelerate successful demonstration of SNF integrated recycling technologies to advance the goals of GNEP. Describe the approach that you believe should be taken to accomplish this goal, including its benefits and risks, and describe your level of interest or potential participation. Also, provide a description of what you believe your approach does to advance the broad goals of GNEP (as described, for example, in the Background section). In particular, for the ABR, DOE is interested in:

a. What reactor unit size (MWt) would be proposed by industry to achieve the ABR mission, and what reactor size would be proposed for the demonstration program (e.g., sub-scale, full-size module)?

b. What set of reactor system technologies (e.g., basic type of fuel, reactor and power conversion technologies) is proposed to achieve the ABR mission?

c. What would the general fuel qualification approach and schedule be for initial driver

fuel and transmutation fuel? Identify the basic in-reactor tests and facilities that would be used to support fuel qualification.

d. In addition to advanced reactor systems, what research and development (R&D) on near-term water-cooled reactor approaches could be pursued to support transmutation of transuranics consistent with the goals of GNEP?

2. Proposed roles of parties involved

Please identify who you believe the parties to such a venture should include and the role of each party. Parties could include U.S. Government and foreign government agencies, state and local government agencies, nongovernmental organizations, domestic and foreign commercial firms (e.g., Architect & Engineering (A&E) firms, component manufacturers, electric utility companies, etc.) or any other entity you may identify that fits into your proposed solution. Your statement should clearly identify the role each party would play in ensuring the success of your proposition, whether direct or indirect. Examples of roles include, but are not limited to, providing financing, guaranteeing financing, A&E services, construction, facility operations, program or project management, regulatory compliance support, and hardware vendor. Provide an assessment of the benefit to the U.S. Government and GNEP of your proposed parties and their roles. Also, provide a description of the benefits that would accrue to each of the parties in this venture. Benefits could include, but are not limited to, financial gain, intellectual property, market position, facilities, education, and advancing policy goals.

3. Resources

For each entity you have identified in Item 2 above, provide specifics describing the resources each party could provide to ensure the program's success. These resources may include, but are not limited to, financial, existing or new facilities, personnel (include a description of the type of personnel, e.g., technical, management, regulatory, financial, etc.), intellectual property, and leased equipment.

4. Proposed contractual vehicle

Please provide a description of the contractual vehicle(s) you feel should be employed in furtherance of your approach. Examples may include, but are not limited to, contracts, financial assistance, Cooperative Research and Development Agreements, loan guarantees, other transactional arrangements. Please limit your suggestions to those contractual authorities already granted to DOE or other government agencies you identify.

5. Areas of technology development required for potential commercialization

Please identify what technical areas associated with your approach would benefit from additional research, development or demonstration (RD&D) activities, how and to what extent this RD&D would mitigate technical or technology risk, estimated timeframes to accomplish this RD&D, parties performing the activities, and other technical issues that need to be addressed.

6. Government furnished data/technology/equipment

Describe what, if any, government furnished data, technology, or equipment you would require to accomplish your defined approach. State whether you have any existing rights or license for the use of the data or technology, and if not, how you would pursue acquiring such rights.

Confidentiality

Confidential or business sensitive information contained in the submission must be identified and marked accordingly. DOE will protect this information from public disclosure to the extent permitted by law.

This EOI is not a formal solicitation requesting proposals and does not represent a commitment by the Government to award a contract. The Government does not intend to formally respond to information submitted in response to this EOI. The Government is not responsible for costs incurred to submit a response to this EOI, conducting other activities associated with pre-solicitation planning, or submitting a proposal in response to a solicitation, if issued.

Issued in Washington, D.C. on July 31, 2006.

Dennis R. Spurgeon

Assistant Secretary for Nuclear Energy, Office of Nuclear Energy